

We claim:

1. A hearing aid, comprising:
  - an input to receive an input signal and output an analog signal;
  - 5 a variable gain amplifier to selectively compress the analog signal;
  - an analog to digital convertor receiving the analog signal and outputting a first digital signal;
  - a digital gain control to control gain of the variable gain amplifier;
  - a compression recapture system outputting a second digital signal that
  - 10 essentially represents a compressed portion of the analog signal;
  - an output to reproduce the input signal based on the first and second digital signals.
- 15 2. The hearing aid of claim 1, wherein the compression recapture system is a feed forward circuit.
3. The hearing aid of claim 2, wherein the compression recapture system includes a transfer function element.
- 20 4. The hearing aid of claim 3, wherein the transfer function element maps the second digital signal from the digital gain control to a compression recapture signal.
5. The hearing aid of claim 4, wherein the compression recapture signal is a digital signal.
- 25 6. The hearing aid of claim 5, wherein the output includes a multiplier that digitally combines the compression recapture signal and the first digital signal to essentially digitally reproduce the input signal.
- 30 7. The hearing aid of claim 6, wherein the output includes a digital signal processor that receives a combined digital signal from the multiplier.

8. The hearing aid of claim 1, wherein the analog to digital convertor includes a threshold, and the variable gain amplifier compresses a portion of the analog signal that is above the threshold.

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9. The hearing aid of claim 1, wherein the digital gain control includes an inhibitor to inhibit distortions and an adjuster to adjust the gain of the variable gain amplifier, wherein the inhibitor digitally smooths an envelope of the first digital signal so as to inhibit distortions arising from apparent modulation of the first digital signal.

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10. The hearing aid of claim 1, wherein the input includes a filter to block low frequencies in the input signal from the analog signal.

11. The hearing aid of claim 1, wherein the digital gain receives the first control to control gain of the variable gain amplifier

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12. The hearing aid of claim 1, wherein the digital gain control outputs a control signal, and the second digital signal is a mathematical inverse of the control signal.

13. The hearing aid of claim 12, wherein the digital gain control includes an digital adjuster to adjust the gain and a digital to analog convertor connected between digital adjuster and the variable gain amplifier.

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14. A method of restoring a compressed signal in an input stage of a hearing aid, comprising:

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detecting when an input signal is above a threshold value to produce a gain control signal;

reducing gain of an amplifier to a value below the threshold value based on the gain control signal; and

restoring an output signal of the input stage to include any reduced gain.

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15. The method of claim 14, wherein detecting includes producing a digital gain control signal.

16. The method of claim 14, wherein restoring includes applying a mathematical  
5 inverse of the gain control signal to restore compression in the input stage.